Confirmation No. 3088

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	HESEN *et al.*	Examiner:	Chhaya, S.
Serial No.:	10/560,447	Group Art Unit:	2895
Filed:	December 12, 2005	Docket No.:	NL030692US1
Title:	LEAD FRAME, METHOD OF MANUFACTURING A SEMICONDUCTOR DEVICE		

APPEAL BRIEF

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Dear Sir:

This Appeal Brief is submitted pursuant to 37 C.F.R. §41.37, in support of the Notice of Appeal filed September 28, 2009 and in response to the rejections of claims 1-10 and 12-16 as set forth in the Final Office Action dated June 26, 2009.

Please charge Deposit Account number 50-4019 (NL030692US) $540.00 for filing this brief in support of an appeal as set forth in 37 C.F.R. §1.17(c). If necessary, authority is given to charge/credit Deposit Account 50-4019 additional fees/overages in support of this filing.

I. Real Party In Interest

The real party in interest is NXP Semiconductors. The application is presently assigned of record, at reel/frame nos. 019719/0843 to NXP, B.V., headquartered in Eindhoven, the Netherlands.

II. Related Appeals and Interferences

While Appellant is aware of other pending applications owned by the above-identified Assignee, Appellant is unaware of any related appeals, interferences or judicial proceedings that would have a bearing on the Board's decision in the instant appeal.

III. Status of Claims

Claims 1-10 and 12-16 stand rejected and are presented for appeal. Claim 11 has been cancelled. A complete listing of the claims under appeal is provided in an Appendix to this Brief.

IV. Status of Amendments

No amendments have been filed subsequent to the Final Office Action dated June 26, 2009.

V. Summary of Claimed Subject Matter

As required by 37 C.F.R. § 41.37(c)(1)(v), a concise explanation of the subject matter defined in the independent claims involved in the appeal is provided herein. Appellant notes that representative subject matter is identified for these claims; however, the abundance of supporting subject matter in the application prohibits identifying all textual and diagrammatic references to each claimed recitation. Appellant thus submits that other application subject matter, which supports the claims but is not specifically identified above, may be found elsewhere in the application. Appellant further notes that this summary does not provide an exhaustive or exclusive view of the present subject matter, and Appellant refers to the appended claims and their legal equivalents for a complete statement of the invention.

Commensurate with independent claim 1, a lead frame includes a frame and first and second connection conductors respectively connected to the frame and provided with a non-

engaging end portion within a perimeter of the frame. *See, e.g.*, Figure 4 and the specification at page 9:9-31. The end portion of the second connection conductor is positioned adjacent an extension of the first connection conductor. *See id.* The second connection conductor is configured to bend along a bending axis that is at an oblique angle with respect to the longitudinal axis of the end portion, to position the end portion of the second connection conductor opposite the first connection conductor to secure a semiconductor element between said connection conductors. *See, e.g.*, Figures 4 and 5, and items 4 and 5, and at page 9:9 to page 10:11.

Commensurate with independent claim 3, an example embodiment is directed to a method of manufacturing a semiconductor device as follows. A semiconductor element and a lead frame are provided. The semiconductor element has first and a second electric connection region situated at opposite sides of the semiconductor element. *See, e.g.*, Figure 4 and page 9:9-31. The lead frame has first and second connection conductors respectively connected to a frame, and has freely-extending end portions, the end portion of the second conductor being bent along a bending axis that is at an oblique angle with respect to a longitudinal axis of the end portion, and extending over the end portion of the first conductor. *See, e.g.*, Figures 4 and 5, and items 4 and 5 as described at page 9:9 to page 10:11. The semiconductor element is fit between the freely-extending end portions of the first connection conductor and the second connection conductor, using connection means to make electroconductive connections between the connection regions and the end portions. *See id.*

Commensurate with independent claim 4, an example embodiment is directed to a method of manufacturing a semiconductor device as follows. A semiconductor element having a first and a second electric connection region, which connection regions are situated on opposite sides of the semiconductor element, is provided. *See, e.g.*, 3 of Figures 2 or 4. A lead frame is also provided, and having a frame with a first and a second connection conductor, which connection conductors are each connected to the frame and provided with an exposed, freely-extending end portion. *See, e.g.*, Figures 2, 4 and 5, and items 4 and 5, and page 9:9 to page 10:11. The semiconductor element is applied to the end portion of the first connection conductor, and an electroconductive connection between the first connection region and the end portion is made using a connection means. *See id.* The end portion of the

second connection conductor is moved to a position outside the plane of the frame and opposite a location for the second connection region of the semiconductor element. *See id.* An electroconductive connection is made between the second connection region and the end portion of the second connection conductor using a connection means. *See id.* The end portion of the second connection conductor within the frame is positioned outside the extension of the first connection conductor and is brought to a position opposite the position for the second connection region of the semiconductor element by bending along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion. *See, e.g.*, Figures 4 and 5, and items 4 and 5, and page 9:9 to page 10:11, and Figures 1-2, and page 8:10 to page 9:8.

Commensurate with independent claim 10, an example embodiment is directed to device for manufacturing a semiconductor device. *See, e.g.*, Figures 7-9 and page 11:1-22. The device includes a transport mechanism for a lead frame with at least two freely-extending connection conductors, positioning means for positioning a semiconductor element, and pusher means for pushing the semiconductor element in between the two connection conductors (of which one is bent to a position above the position of the other one). *See, e.g.*, Figures 7-8 and items 4, 7 and 66 and page 11:1-22. The device also includes means for bending an end portion of at least one of the connection conductors along a bending axis which makes an oblique angle with the longitudinal axis of the end portion. *See id.*

Commensurate with independent claim 13, an example embodiment is directed to a semiconductor device comprising a semiconductor element, first and second connection conductors and an isolating envelope. *See, e.g.*, Figures 4-6 and page 9:9 to page 10:11. The semiconductor element has a first and a second electric connection region respectively situated on opposite sides of the semiconductor element. *See, e.g.*, Figure 4 and items 4, 5 and page 9:9 to page 10:3. The first connection conductor has a contact, and facing away therefrom an end portion that is electroconductively connected to the first connection region. *See, e.g.*, item 4 in Figure 4. The second connection conductor has a contact, and facing away therefrom, an end portion that is bent along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion. *See, e.g.*, items 5a, 5b in Figure 4.

The end portion is situated opposite the second electric connection region, with which it is electroconductively connected, while the contact is situated in the same plane as the contact of the first connection conductor. *See, e.g.*, Figure 4 and page 9:9 to page 10:3. The end portion has a further bent region in contact with the second electric connection region, and has a length that corresponds approximately to the thickness of the semiconductor element. *See id.* An isolating envelope leaves contacts facing way from the end portions of the connection conductors uncovered. *See, e.g.*, item 9 in Figure 6 and page 10:28-34.

VI. Grounds of Rejection to be Reviewed Upon Appeal

The grounds of rejection to be reviewed on appeal are as follows:

A. Claims 1-7, 9-13 and 15 stand rejected under 35 U.S.C. § 102(b) over Coldren (U.S. Patent No. 4,252,864).

B. Claims 8 and 14 stand rejected under 35 U.S.C. § 103(a) over the '864 reference in view of Sakamoto (U.S. Patent No. 6,975,022).

VII. Argument

Generally, the §§ 102 and 103 rejections fail to establish correspondence to the claimed invention, and aspects of the cited references teach away from the assertions made in the (final) Office Action. Specifically, the Office Actions of record (as well as the Advisory Action) ignore various limitations as well as Appellant's traversals, in presenting assertions about broad aspects of the cited references without addressing or establishing correspondence to all claim limitations as required under the M.P.E.P. and applicable law. The Office Actions of record have also completely ignored the lack of motivation/teaching away as addressed in Appellant's traversals, which now stand uncontested in the record. Accordingly, Appellant believes that all rejections are improper for failing to establish correspondence to the claimed invention, and in the context of the § 103 rejections, for failing to establish motivation in view of the clear teaching away. The following addresses this lack of correspondence in greater detail, as well as the impropriety of the rejections under § 103 in view of the lack of motivation/teaching away in the references themselves.

A. The § 102(b) Rejections Have Failed To Establish Correspondence.

As applicable to all claim rejections under § 102(b), the Office Action has failed to show or explain correspondence to multiple claim limitations, contrary to the requirements of § 102(b). For example, the Office Action has relied upon vague citations to figures as allegedly corresponding to entire claims, yet provides no explanation whatsoever as to where correspondence lies in the cited reference and fails to address (or show correspondence to) every limitation. Instead of explaining how the cited '864 reference corresponds as required under the M.P.E.P. and § 102(b), the Office Action has simply repeated Appellant's claim limitations and followed the repeated limitations with unexplained citations. Appellant has reviewed the cited portions of the '864 reference and has been unable to identify any correspondence as asserted or otherwise. Accordingly, all § 102(b) rejections are improper and should be removed. The following sections separately address lack of correspondence in various claims as referenced.

1. The Office Action Has Failed To Establish Correspondence To Multiple Claim Limitations In Claims 1-7, 9-13 and 15.

As consistent with Appellant's traversals of record, the '864 reference fails to disclose various claim limitations including those directed to a lead frame having non-engaging end portions that electrically connect to opposite sides of a semiconductor element (*see, e.g.*, independent claims 1 and 3), as well as to various other characteristics of the claimed lead frame. For example, the cited portions of the '864 reference describe a contact on a semiconductor element (chip) itself instead of a lead frame (see "contact area 24" in Figure 3), and fail to disclose a lead frame having connection conductors that are located within an outer perimeter of the frame, as well as connectors that respectively freely extend in order to secure a semiconductor element. The alleged "connectors" cited in the Office Action are neither freely-extending or within a perimeter. Referring to Figure 4 (copied below), the cited connectors (see supporting region 34 of FIG. 4) are fixed at both ends. Accordingly, the Examiner's assertions of record (as further emphasized in the Advisory Action), that the '864 reference indeed discloses a "lead frame," stop far short of establishing

correspondence under § 102 to limitations directed to specific aspects of such a lead frame, to which no correspondence has been established.

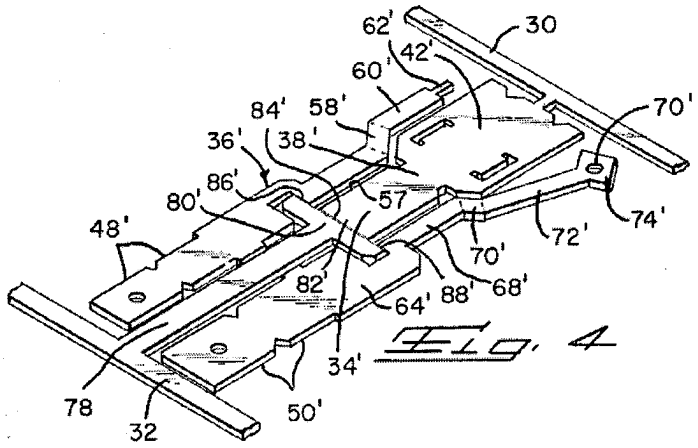

Fig. 4

Specifically, the asserted "connection conductors" (*e.g.*, 74) of the '864 reference are not within a perimeter of any lead frame, and the lower supporting region 34 is fixed at both ends. This is also consistent with Figure 5, copied below for convenience. Referring again to Figure 4, the central portion of the lead frame (*e.g.*, 42', 78) is engaged to carrier strips 30 and 32 at both ends of the lead frame, thus fixing the asserted lead frame. In addition, the connection conductors 74' clearly extend away from the asserted lead frame and continue to be so arranged after engagement as shown in Figure 5.

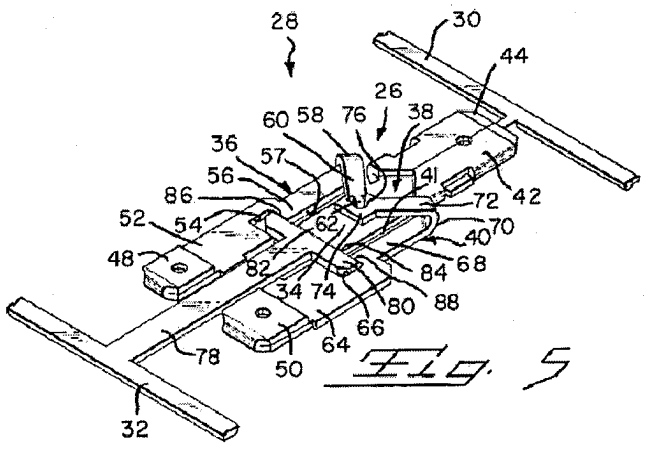

Fig. 5

Accordingly, the cited portions of the '864 reference, including Figures 4 and 5 and their corresponding discussion, fail to correspond to claim limitations as asserted, including those directed to connectors having a "non-engaging end portion within a perimeter of the frame" (*see* independent claim 1). In addition, while end portions 62 and 74 are not engaged,

they both connect to the same side of a chip (*see, e.g.*, Figure 5 above, showing end portion 62 extending into an opening 70 in end portion 74). Thus, there is no disclosure of two end portions that respectively engage opposite sides of a semiconductor element as claimed.

The § 102(b) rejections of claims 1-7, 9-13 and 15 are thus improper and should be reversed.

2. **The Office Action Has Failed To Establish Correspondence To Claims 3, 4 and 10.**

As discussed above, the Office Action has failed to cite correspondence to limitations relevant to each claim, including those involving a lead frame with connectors having end portions within a perimeter of a frame. Generally, the cited "lead frame" does not have components that either extend freely or do so within a perimeter as claimed. As consistent with FIG. 5 above, the '864 reference does not disclose freely-extending end portions as asserted, as the asserted portions are coupled to carrier strips 30 and 32.

As further specific to claims 3, 4 and 10 and the rejection in the (final) Office Action, instead of explaining how the cited '864 reference corresponds to the amended limitations, the Examiner simply repeated Appellant's claim limitations and followed the repeated limitations with a vague citation to "Figures 1-5." Specifically, claim 3 (as amended) includes limitations directed to "first and second connection conductors respectively connected to a frame and having freely-extending end portions, the end portion of the second conductor being bent along a bending axis that is at an oblique angle with respect to a longitudinal axis of the end portion, and extending over the end portion of the first conductor." Claim 4 further recites that such end portions are within a frame. The Office Action has failed to establish correspondence to these limitations.

3. **The Office Action Has Failed To Establish Correspondence To Claims 5 and 13 And Appears To Be Improperly Based Upon An "Obvious To Try" Assertion.**

As discussed above, the Office Action has failed to cite correspondence to limitations relevant to each claim, including those involving a lead frame with connectors having end

portions within a perimeter of a frame. The cited "lead frame" does not have components that either extend freely or do so within a perimeter as claimed.

In addition, the cited portions of the '864 reference also fail to provide correspondence to various method-based limitations in claim 5 (and relative to claim 13) directed to characterizing the bends of the connection conductors. For instance, respective portions of a lead frame are bent at 90 degrees along an out-of-plane bending axis, with an end of the conductor corresponding to the thickness of a semiconductor element again bent through 90 degrees. Regarding the Examiner's indicated confusion of the limitations in claim 13, Appellant notes the cited references similarly fail to disclose related limitations involving connection conductors bent along axes at oblique angles as claimed, with respective arrangements.

The Office Action's apparent attempt (see page 13) to address Appellant's traversals regarding these matters is further inappropriate because it amounts to an unsupported "Obvious to Try" assertion of what the cited conductors "would have to go through," without providing actual correspondence to these limitations (in violation of § 102, yet further failing to show motivation/suggestion under § 103). Such a rejection, has been reviewed and assessed adversely by the *In re Kubin* court which explains that the "obvious to try" standard may not be applied where one would have "to vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful." *In re Kubin* (Fed. Cir. April 3, 2009), *interpreting KSR.*[1] See also M.P.E.P. § 2143(E), and *Gillette Co. v. S.C. Johnson & Son, Inc.,* 919 F.2d 720, 725 (Fed. Cir. 1990). Here, while one of skill in the art could try a multitude of different manners in which to make a connection, nothing in the record supports the Examiner's conclusion that one of skill in the art would necessarily make a connection as claimed. This overly-broad thinking is exactly that which has been rejected by the *In re Kubin* Court as giving "either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful."

[1] *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398 (U.S. 2007)

Accordingly, the § 102 rejection of claims 5 and 13 are also improper and should be removed.

C. The § 103 Rejections Are Improper Because The References Cannot Be Combined As Asserted, And Teach Away From The Same.

The § 103 rejection of claims 8 and 14 is improper because the cited references teach away from the Office Action's proposed combination, as established by Appellant's traversals of record and uncontroverted in the Office Action. The Examiner's attempt to address this teaching away amounts to an unrelated argument about what claims 8 and 14 discuss, but fails to address Appellant's traversals identifying improprieties with the proposed combination of references, the impropriety of which is not dependent upon Appellant's claims.

Specifically, combining the references as asserted to arrive at the claimed invention would entail moving the member 30 as consistent with the Office Action. However, the '022 reference explicitly teaches away from such movement in teaching that member 30 is fixed in place. The proposed combination of references thus directly contradicts the purpose and teachings of the '022 reference. Consistent with the recent Supreme Court decision in *KSR (cited above)*, M.P.E.P. § 2143.01 explains the long-standing principle that a § 103 rejection cannot be maintained when the asserted modification undermines either the operation or the purpose of the main reference - the rationale being that the prior art teaches away from such a modification. *See KSR at* 1742 ("[W]hen the prior art teaches away from combining certain known elements, discovery of a successful means of combining them is more likely to be non-obvious."). Under M.P.E.P. § 2143.01, the rejections should be reversed.

C. The § 103 Rejections Are Improper Because The Cited References Do Not Correspond As Asserted.

As consistent with the above discussion of the impropriety of § 102(b) rejections, the § 103(a) rejection of claims 8 and 14 (which is also based upon the '864 reference) is improper because the Office Action has not established correspondence in the cited '864 reference, either alone or in combination with the '022 reference. None of the asserted references provides correspondence to a lead frame having non-engaging end portions that

electrically connect to opposite sides of a semiconductor element, connection conductors that are located within an outer perimeter of a frame, and connectors that respectively freely extend in order to secure a semiconductor element.

The cited references further fail to provide correspondence to claims 8 and 14 as asserted, as the Office Action has (again) cited to multiple figures and discussion without providing an explanation as to which portions of the references discuss limitations (*i.e.*, those directed to a hole and to a pusher member). Appellant has also reviewed the references for these limitations but cannot ascertain (operable) disclosure of these and other claim limitations. For instance, the cited portions of columns 8 and 9 of the '022 reference do not appear to discuss any pusher member or moving any semiconductor element, which is consistent with the Office Action's indication (*see* page 14) that "[t]he word "push" can be defined to "press against forcefully without moving." While Appellant appreciates the Examiner's definition, this definition fails to provide correspondence to claim limitations directed to pushing a semiconductor element "between the connection conductors" (*i.e.*, by moving the element). Accordingly, neither reference discloses moving a semiconductor element with a pusher member as claimed, and the § 103 references should be reversed.

VIII. Conclusion

In view of the above, Appellant submits that the rejections of claims 1-10 and 12-16 are improper and therefore requests reversal of the rejections as applied to the appealed claims and allowance of the entire application.

Authority to charge the undersigned's deposit account was provided on the first page of this brief.

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APPENDIX OF CLAIMS INVOLVED IN THE APPEAL
(S/N 10/560,447)

1. A lead frame comprising:

a frame;

first and second connection conductors respectively connected to the frame and provided with a non-engaging end portion within a perimeter of the frame, the end portion of the second connection conductor being positioned adjacent an extension of the first connection conductor, the second connection conductor configured to bend along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion to position the end portion of the second connection conductor opposite the first connection conductor to secure a semiconductor element between said connection conductors.

2. A lead frame as claimed in claim 1, characterized in that the end portion of the second connection conductor is positioned opposite the position of the semiconductor element and bent along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion.

3. A method of manufacturing a semiconductor device comprising the steps of:

- providing a semiconductor element having a first and a second electric connection region which connection regions are situated at opposite sides of the semiconductor element;

- providing a lead frame having first and second connection conductors respectively connected to a frame and having freely-extending end portions, the end portion of the second conductor being bent along a bending axis that is at an oblique angle with respect to a longitudinal axis of the end portion, and extending over the end portion of the first conductor; and

- fitting the semiconductor element between the freely-extending end portions of the first connection conductor and the second connection conductor, using connection means to make electroconductive connections between the connection regions and the end portions.

4. A method of manufacturing a semiconductor device comprising the steps of:

- providing a semiconductor element having a first and a second electric connection region, which connection regions are situated on opposite sides of the semiconductor element;

- providing a lead frame having a frame with a first and a second connection conductor, which connection conductors are each connected to the frame and provided with an exposed, freely-extending end portion;

- applying the semiconductor element to the end portion of the first connection conductor, an electroconductive connection between the first connection region and the end portion being made by using a connection means;

- moving the end portion of the second connection conductor to a position outside the plane of the frame and opposite a location for the second connection region of the semiconductor element,

- making an electroconductive connection between the second connection region and the end portion of the second connection conductor by using a connection means,

characterized in that the end portion of the second connection conductor within the frame is positioned outside the extension of the first connection conductor and is brought to a position opposite the position for the second connection region of the semiconductor element by bending along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion.

5. A method as claimed in claim 4, characterized in that the end of the end portion of the second connection conductor is bent through approximately 90 degrees along the bending axis out of the plane of the frame, and the end of the end portion is bent, along a further bending axis extending substantially parallel to the bending axis and at a distance therefrom corresponding approximately to the thickness of the semiconductor element, through an angle of approximately 90 degrees to the position of the semiconductor element.

6. A method as claimed in claim 5, characterized in that the end portion of the second connection conductor is bent along the further bending axis or along another bending axis in

such a manner that said end portion extends obliquely in at least one direction with respect to the end portion of the first connection conductor which contains the position for the semiconductor element.

7. A method as claimed in claim 4, characterized in that the semiconductor element is slid between the connection conductors after the end portion of the second connection conductor has been bent to a position opposite the location for the second connection region of the semiconductor element and opposite the end portion of the first connection conductor, the element being clamped between the connection conductors.

8. A method as claimed in claim 3, characterized in that

- a lead frame is chosen in which the first connection conductor is provided with a hole at a distance from the position of the semiconductor element;

- the semiconductor element is placed on the hole and fixed by means of a suction device present below the hole, after which the semiconductor element is pushed between the connection conductors by means of a pusher member.

9. A method as claimed in claim 3, characterized in that before the semiconductor element is slid between the connection conductors, the end portion of the first connection conductor is maintained in a depressed position by means of a pressure member, until the semiconductor element has been slid between the connection conductors.

10. A device for manufacturing a semiconductor device-the device comprising:

- a transport mechanism for a lead frame with at least two freely-extending connection conductors;

- positioning means for positioning a semiconductor element;

- pusher means for pushing the semiconductor element in between the two connection conductors, of which one is bent to a position above the position of the other one; and

means for bending an end portion of at least one of the connection conductors along a bending axis which makes an oblique angle with the longitudinal axis of the end portion.

12. A device as claimed in claim 10, characterized in that it comprises pressure means for pressing downward one of the conductor tracks, during the pushing against the semiconductor element.

13. A semiconductor device comprising:

- a semiconductor element which is provided with a first and a second electric connection region, which connection regions are situated on opposite sides of the semiconductor element;

- a first connection conductor having a contact, and facing away therefrom an end portion which is electroconductively connected to the first connection region;

- a second connection conductor having a contact, and facing away therefrom, an end portion which is bent along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion, such that the end portion is situated opposite the second electric connection region, with which it is electroconductively connected, while the contact is situated in the same plane as the contact of the first connection conductor, the end portion having a further bent region in contact with the second electric connection region and having a length that corresponds approximately to the thickness of the semiconductor element; and

- an isolating envelope which leaves contacts facing way from the end portions of the connection conductors uncovered.

14. A semiconductor device as claimed in claim 13, characterized in that:

- the semiconductor element is a semiconductor diode;

- the second connection conductor is u-shaped or j-shaped prior to bending,

- for the oblique angle, an angle in the range between 70 and 80 degrees is selected, and

- the contacts of the connection conductors are in line with one another.

15. A semiconductor device as claimed in claim 13, characterized in that:

- the semiconductor element is a semiconductor transistor with a third connection region; and

- a third connection conductor is present, which has a contact, and facing away therefrom, an end portion which is bent along a bending axis which is at an oblique angle with respect to the longitudinal axis of the end portion, such that the end portion is situated opposite the third electric connection region, with which it is electroconductively connected, while the contact is situated in the same plane as the contact of the first connection conductor;

- the second and the third connection conductor are situated on either side of the first connection conductor.

16. A semiconductor device as claimed in claim 13, or a lead frame as claimed in claim 1, characterized in that the first connection conductor is provided with a hole at a distance from the position for the semiconductor element.

APPENDIX OF EVIDENCE

Appellant is unaware of any evidence submitted in this application pursuant to 37 C.F.R. §§ 1.130, 1.131, and 1.132.

APPENDIX OF RELATED PROCEEDINGS

As stated in Section II above, Appellant is unaware of any related appeals, interferences or judicial proceedings.